

### Registration of N98-4445A Mid-Oleic Soybean Germplasm Line

Soybean [*Glycine max* (L.) Merr.] germplasm line N98-4445A (Reg. no. GP-313, PI 636691) was developed and released in 2002 by USDA-ARS, in cooperation with the North Carolina Agricultural Research Service. This line has a concentration of oleic acid in the seed oil that is approximately 550 g kg<sup>-1</sup>. This is between 340 and 380 g kg<sup>-1</sup> greater than commercial soybean varieties and 47 g kg<sup>-1</sup> more than the highest oleic acid concentration available in the U.S. germplasm collection. The germplasm will be a useful genetic resource for breeding mid-oleic soybean varieties, that is, those with concentrations of oleic acid between 400 and 700 g kg<sup>-1</sup>. Increased oleic acid in this line causes a correlated decrease in polyunsaturated fatty acids giving the added advantage of linolenic acid concentrations of less than 30 g kg<sup>-1</sup>.

N98-4445A originated as an F<sub>5</sub> single plant selection from the three-way cross N94-2473 × (N93-2007-4 × N92-3907). The F<sub>2</sub> generation from the cross was grown at Clayton, NC, in 1997. A single F<sub>2</sub> plant selection with 531 g kg<sup>-1</sup> oleic acid was selected for further evaluation as an F<sub>2:3</sub> line in 1998. That line, N98-4445, had an oleic acid concentration of 606 g kg<sup>-1</sup> and 512 g kg<sup>-1</sup> when grown at Clayton, NC, in 1998 and 1999, respectively. A single F<sub>5</sub> plant with good seed quality and oleic acid concentration of 540 g kg<sup>-1</sup> was harvested from the 2000 planting of N98-4445 at Clayton. This F<sub>5:6</sub> line (designated N98-4445A) was seed increased in a winter nursery for germplasm release. Mean oleic acid concentration of N98-4445A in eight environments in 2003 was 549 g kg<sup>-1</sup> with a standard deviation of 87 g kg<sup>-1</sup> (Table 1). The standard Group IV cultivar Mustang (Schmidt et al., 1997) had 238 g kg<sup>-1</sup> oleic acid in the same environments. Mean yield of N98-4445A at two North Carolina locations in 2003 was 2122 kg ha<sup>-1</sup>. This was 17% lower than the yield of Mustang in the same tests.

The cross N94-2473 × (N93-2007-4 × N92-3907), from which N98-4445A was derived, has a complex pedigree (When reading this manuscript on line, click the "supplemental" link to view Supplemental Fig. 1). The original breeding research on oil quality began with a recurrent selection experiment, and initial improved breeding lines, N78-2245 and N79-2077, were selections from the fifth cycle of that experiment (Burton et al., 1983; Carver et al., 1986). The parents of the initial population were PI 90406, PI 92567, and N69-2774 (Brim and Young, 1971). Ancestors of N79-2473 were selected for lower linolenic acid and increased yielding ability. Ancestors of N92-3906 were selected for lower palmitic acid and increased yielding ability (Rebetzke et al., 1998). Ancestors of N93-2007-4 were selected in a breeding effort to combine both low linolenic acid with lower palmitic acid.

The maternal parent of the original three-way cross, N94-2473, was a selection from the cross, N90-2001 × N89-922.

N89-922 was derived from the cross, N83-1014 × N85-2124. Parents of N83-1014 were the cultivars 'Gasoy 17' (Baker and Harris, 1979) and N77-940. Parents of N85-2124 were N78-2245 and PI 123440. Ancestors of N77-940 were selected for higher yield and agronomic quality, and the line was used in this pedigree to introduce genetics for higher yield and better adaptation into the oil quality breeding population. The line N77-940 was derived from the cross N70-1549 × D70-3185. Parents of N70-1549 were the cultivar Dare (Brim, 1966) and D65-6765. Parents of D70-3185 were the line D64-4636 and the cultivar Lee (Johnson, 1958). The cultivar Hill (Johnson, 1960) and N58-3311 were parents of D64-4636. D58-3311 was a selection from Jackson (4) × D49-2491 (Johnson, 1958). D49-2491 is a sister line of Lee. Parents of D65-6765 were D58-3358 and D59-9289. D58-3358 was a sister line of D85-3311. D59-9289 was derived from D51-4877 × D55-4168. Parents of D51-4877 were 'Roanoke' (Weiss, 1953a) and N45-745. Parents of D55-4168 were 'Ogden' (Weiss, 1953b) and 'Biloxi' (PI 548444). N45-745 was derived from Ogden × 'CNS' (PI 548445). The maternal parent of N94-2473 was N90-2001. It was derived from a cross between N85-2166 and a selection from the cross, N83-375 × N85-2176. Both N85-2176 and N85-2166 were derived from N78-2245 × PI 123440 (Burton et al., 1989). The line N83-375 was derived from N76-098 × N76-683 and was used as a source of genetics for higher productivity. Parents of N76-098 were N70-1741 and 'Essex' (Smith and Camper, 1973). Parents of N76-683 were N70-1501 and N70-2173. Both N70-1741 and N70-1501 were derived from the cross, Dare × D65-6765. 'Hampton' (Webb and Hicks, 1965) and 'Ransom' (Brim and Elledge, 1973) were parents of N70-2173.

The two other parents of N98-4445A were N93-2007-4 and N92-3907. N93-2007-4 was selected from a cross between N90-2013 and C1726 (Wilcox and Cavins, 1990). C1726 is a low palmitic germplasm derived by mutagenesis from the cultivar 'Century' (Wilcox et al., 1980). N90-2013 is derived from the cross, PI123, 440 × N79-2077-12 (Burton et al., 1994). N79-2077-12 is a low palmitic germplasm derived from the fifth cycle population of the same recurrent selection experiment that N78-2245 was derived from.

The third parent of N98-4445A, N92-3907, was a selection from the cross, N87-2122-4 × 9273 (Rebetzke et al., 1998). N87-2122-4 (Burton et al., 1994) is a low palmitic germplasm derived from a cross between N78-2245 and N79-2077. Ancestors of 9273 were selected for improved yield and agronomic quality. Parents of 9273 were 2981 and A3127. 2981 was derived from a cross between S20 and Hark (Weber, 1967). A3127 was derived from a cross between Williams (Bernard and Lindahl, 1972) and Essex. Parents of S20 were L15 and C1423. L15 was derived from the cross 'Wayne' (6) × 'Clark 63' (Williams and Bernard, 1964; Bernard, 1966). C1423 was derived from C1266R (8) × C1253. Parents of C1266R were 'Harosoy' (Weiss and Stevenson, 1955) and C1079. C1079 was a selection from C985 which was derived from a cross between 'Lincoln' (Weiss, 1953a) and Ogden. C1253 was derived from a cross between 'Blackhawk' (Weiss, 1953a) and Harosoy.

N78-4445A has group IV maturity. Planted 21 June at Clayton, NC, in 2001, it matured on 3 October, 1 d later than the cultivar Clark (Johnson, 1958). Seed size was 17.0 g per 100 seeds. It has indeterminate growth habit, white flowers, and tawny pubescence. Seeds are shiny yellow with brown hila. Susceptibility to disease is not known. However, moderate levels of *Soybean mosaic virus* were observed on plants in the 2000 production along with some mottling of harvested seeds.

Small quantities of seed may be obtained from the corresponding author for at least 5 yr. Recipients of seed are asked to make appropriate recognition of the source of the

**Table 1. Means and standard deviation for fatty acid components of seed oil from N98-4445A and a check cultivar in eight environments in 2003.†**

	Fatty acid				
	Palmitic	Stearic	Oleic	Linoleic	Linolenic
	g kg <sup>-1</sup>				
N98-4445A	90(5)‡	36(3)	549(87)	296(76)	29(7)
Mustang	112(4)	38(2)	238(39)	533(29)	79(11)

† Environments include Plymouth, NC, Clayton, NC, two planting dates at Portageville, MO, two planting dates at Quantico, MD, and two planting dates at Knoxville, TN.

‡ Standard deviation in parenthesis.

germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

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